SUMMARY AND RECOMMENDATIONS

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This conference was sponsored by the Travel Model Improvement Program.[1] There were two principal goals of the conference:

- to improve understanding of the influence on travel behavior of urban development patterns specifically designed to reduce motor vehicle travel and
- to assess the potential for telecommunications, particularly telecommuting, to reduce motor vehicle travel.

The conference was charged with identifying what is already known and unknown about these effects, what of this knowledge can be applied today for use by Metropolitan Planning Organizations (MPO) and state Department of Transportation (DOT) planners, and what research and development on these subjects is needed to improve today's urban and transportation planning practices. Deliberations at the conference were organized in three subject tracks each of which addressed several specific questions related to its subject.

WORKSHOP 1 — PRINCIPLES OF URBAN DESIGN, CHAIRED BY FRANK SPIELBERG

This workshop enumerated the basic components of urban design and identified which among those components are likely to affect travel behavior. Features that distinguish the "New Urbanism" from conventional development were described. Papers prepared for this session by Edward Beimborn and by Michael Southworth with Eran Ben-Joseph are not included in the compendium of papers from the conference, accompanying this summary.

The workshop then discussed what transportation facilities are appropriate for New Urbanism communities and how those facilities should be designed to serve and blend with these designs. The

[1]The Travel Model Improvement Program is sponsored by the Federal Highway Administration, the Federal Transit Administration, the Office of the Secretary of Transportation and the Environmental Protection Agency.

discussion included consideration of how carefully integrated urban design and transportation facilities affect travel behavior, e.g., destination, mode and route choice.

Finally the workshop enumerated key questions about the design/transportation relationship that need to be answered through further research and development. Principal among these is: What are the mechanisms that cause different urban designs to affect travel in various ways? A major concern is how to increase the consideration of the urban design/transportation concepts and effects in urban and transportation planning in MPOs and state DOTs. Papers by Eran Ben-Joseph, Keith Lawton and Michael Replogle were prepared for presentation in this session; however, only Michael Replogle's paper is included in the accompanying compendium of papers.

Recommendations

There was general agreement that urban design features have important effects on travel behavior and that more research is needed to better understand the mechanisms by which those influences occur. Even if those effects are presently small, the cumulative effects and compounding such effects over time will be important. The workshop discussed several very specific issues related to the influence of site design on vehicle trip generation and parking. These issues will be of considerable interest to traffic engineers, city planners and public works directors.

A basic issue considered by the workshop was how to characterize land use or, stated another way: How do we "measure" urban design?

- What are the important elements of urban design?
- How should these elements be measured or quantified?

One response to those questions is to draw from the architecture and urban design literature and vocabulary (e.g., Madison, Wisconsin, *"Urban Characters")*. Different elements may be important for different travel decisions; e.g., proximity and diversity of activities for destination choice. Quality of the development on the travel path may influence mode choice.

Research is needed on the factors that influence choice of housing type and location. This is more than simply land use allocation; it goes to the heart of decision considerations and behavior. Techniques that should be considered for such assessments include:

- Stated preference techniques need care to consider problems in representing visual choice.
- Repeated cross-sectional survey studies need careful design (e.g., Seattle housing preference studies).
- Longitudinal panel surveys are another possible technique.

Research is also needed to fully document travel behavior in existing traditional neighborhoods.

Travel behavior and choices are affected by site layout and urban design in both residential and non-residential location. The effects of design of both kinds of areas on travel behavior need to be further studied (e.g., availability of services close to the work place can affect mode-of-travel to work decisions).

There was general agreement that the effects of urban design on all aspects of travel behavior must be studied more thoroughly. This would include more work on the effects of urban design on vehicle ownership. Research is needed on the effects of urban design on destination choice and mode choice, and these choices should be treated as a unit rather than as separate decisions. These analyses will require greater trip type/trip purpose stratification than is typically applied. This examination should be at the household level rather than by traffic zones, especially for walk and bike trips. Many existing pedestrian and bike studies are for college towns. The special conditions affecting such travel should be considered before the transferability of findings from such studies is accepted.

The "substitutability of equivalent goods" effect must be considered in destination choice (i.e., opportunity model vs. gravity model).

Specific Topics for Study

Perception of walking distance (impedance) as related to facade continuity: studies have shown that bleak areas and parking lots interrupt walking patterns.

Parental chauffeuring of children: this should be covered in activity and trip chaining studies.

The issue of personal security as it affects travel choice: personal security in the vehicle, fear of public places, walled and gated communities are emerging concerns.

Reconciliation of Institute of Transportation Engineers (ITE) trip generation rates is needed: these rates are used by many communities to quantify development impacts and by many MPOs for trip generation forecasts. The concern is due to the questionable validity of those rates because of the inconsistency of conditions.

Planning agencies will need to respond to questions about urban design effects, and they need adequate analysis tools and valid data if they are to provide accurate and reasonable answers.

WORKSHOP 2 — EFFECTS OF URBAN DESIGN ON TRAVEL BEHAVIOR, CHAIRED BY BRUCE DOUGLAS

This workshop began with consideration of current policy issues and a review of previous attempts to understand the influence of urban design on travel. The growing awareness of the need to consider and address these effects was indicated. A framework for assessing the current practice in regard to assessing these effects was developed. Jeffrey Zupan provided a presentation on these subjects.

Next the workshop discussed how elements of the travel environment influence travel choices and how urban design features affect the mechanism by which those effects occur. How policy and urban design features enter into that influence was also considered. Explanatory variables that reflect those elements and characteristics were then identified. How those elements and characteristics could be defined and measured and incorporated in travel models were considered. Consideration of the ambiguousness and colinearity in such models was addressed as well. A paper by G. Scott Rutherford, Edward McCormack and Martina Wilkinson presented in this session is in the compendium of papers.

The workshop then turned its consideration to the factors that influence travel. The data needed to support the influential variables were identified along with the potential sources or surrogates for that data. Consideration of how to develop the desired variables from available or potential data was then undertaken. The range of values and travel choice sensitivities for desired variables and how those variables can be forecast was considered. The potential policy implications of using the desired variables were also addressed.

Then the discussions moved to considerations for developing travel models using this new kind of information. The state of the practice for incorporating urban design influences in travel models was reviewed, and several potential model frameworks were discussed. One of these was presented in a paper by Ronald Eash that is included in the accompanying compendium.

Recommendations

One recommendation emerging from this workshop was to develop a synthesis of existing knowledge about the effects of urban design on travel behavior. This is a high priority, immediate need. There should be major efforts to identify and assess existing:

- Urban design/urban form and travel demand forecasting model activities
- Data bases of related urban design and travel
- Current and recent relevant research results
- Research projects pending or underway
- Research proposals that seem to offer merit for increased understanding

This effort will require careful analysis of methods and data quality, not just a summary of results. The assessment should begin with a synthesis of findings from Transit Cooperative Research Program (TCRP) project H-1, which is already 2-3 years old. A network should be established among active and interested researchers and agencies to share and integrate findings.

The FHWA should identify or establish a clearinghouse as a repository for findings from all related research activity, not just that sponsored by FHWA. This effort has begun with the Travel Model Improvement Program. The clearinghouse should include a web site that would provide periodic status reports and routine updates in old, new or current research activities. The web site should also encourage and facilitate contributions to the clearinghouse from researchers and users or other contributors.

There should also be a newsletter established as a print extension of the clearinghouse for users and other interested persons that do not have access to the web. The newsletter and clearinghouse should provide a summary or digest of information, particularly of new information, added to the clearinghouse. It would also be helpful to provide a less technical reporting process for persons not interested in extensive technical detail.

Research Projects to Enhance Current Practice

Define urban design/urban form:

- Relate urban design/urban form variables to measures of accessibility - spatial, temporal, modal.
- Relate urban design/urban form variables to infrastructure characteristics so transportation agencies, planners and decision-makers can visualize what we are modeling and assess implementation issues.

Identify and rank urban design/urban form variables for origin and destination ends of trips:

- Develop a matrix of impacts and incidence that will facilitate identifying questions to be answered.
- Develop an ordered list of variables to explore: already considered, under investigation, deferred until later.

Expand research on recent home interview surveys and other travel datasets:

- Include activities that require travel
- Include walk trip data
- Limit additional data collection
- Geocode to census geography

Develop easily derived urban design/urban form variables:

- Reduce need for new data collection
- Include census block density
- Identify street/roadway density, e.g., lane mile ratio

Compare differences in travel behavior with respect to urban design/urban form in different regions:

- Substitution of travel for in-home activities
- Substitution of walk for motorized travel
- Identification of variables with explanatory power

Develop techniques and models to incorporate urban design/urban form variables into current travel forecasting process:

- Reflect modal differences at each step
- Consider and adopt post/pre-processing potential
- Identify methods to forecast change in urban design/urban form variables

Establish a modeling test bed for urban design/urban form research

Consider greater diversity of urban design/urban form, travel choices

Understand linkage between preferences and travel:

Preferences/Needs
|
Activities (long term, weekly, daily)
|
In-home--> Activities <-- Out-of-home
|
Person Trips
|
Walk or Bike vs. vehicle

Data Collection - Needed Research into Demonstrated Behavior

Identify sources for data needed to quantify variables of interest

Existing data files:

- Census data
- GIS layers
- Computations from existing data
- Collected by other agencies (e.g., street geometry)
- What primary collection required?
- Identify primary collection required.

Design data collection programs

Assess data collection costs for variables

Conduct attitudinal and preference research

- Do residents of "urban designed" areas really prefer their environment?

- Is the location selection decision a matter of life-style (long term decision) rather than trip-related (short term importance)?

WORKSHOP 3 — EFFECTS OF TELECOMMUNICATION ON TRAVEL BEHAVIOR, CHAIRED BY PAT MOKHTARIAN

The deliberations of this workshop began with discussion of how and the degree to which telecommunications influence travel behavior. It was concluded that telecommunication would have different kinds, degrees and mechanisms of effects on travel for different purposes, e.g., business versus shopping travel. Other considerations were the effects on mobile workers, e.g., traveling salespersons, the impact of distance learning, delivery of medical services and government services. Papers for this session were prepared by Patricia L. Mokhtarian and John S. Niles.

The workshop then addressed the impacts of telecommunications on homes, neighborhoods and offices. These considerations included how telecommunications affect the location and design of homes and offices and the delivery of community services. The workshop also discussed the effectiveness of community telecommunication centers for reducing travel. Other topics considered in this session included the potential for improved telecommunication from fiber optics, what degree synergistic potential there is between development and telecommunication, and the potential secondary effect on real estate of such synergism. Walter Seimbab prepared a paper for this session.

The final session of this workshop dealt with the effects of telecommunication on urban design and regional form. Of particular concern was the potential for telecommunication to exacerbate suburban sprawl development to the degree that distance and place may no longer impede human interaction. On the positive side it was suggested that telecommunication could be a development tool, facilitating interaction where development is desired. The differences in effects by scale and extent were also considered. Melvin Levin, Roger Stough, Mohammad Tayyaran and A.M. Khan prepared papers for this session.

Recommendations

What do we think we know?

Regarding telecommuting adoption:

- Slower than expected; a significant portion of the workforce either can't, doesn't want to, or doesn't choose to telecommute; and those who do telecommute do so predominantly part-time. Levels of adoption are likely to increase in the future – but perhaps not as rapidly as expected, in part because constraints are often imposed on existing adopters so they quit telecommuting (at least for a while).

Regarding transportation impacts of telecommuting:

- In the short term for telecommuters, there is a clear reduction in trips and peak-period trips (except for center-based telecommuters), Vehicle Mile(s) Traveled (VMT), and emissions.
- However, when the frequency of telecommuting is taken into account, the reduction is a relatively small proportion of telecommuters' total weekday travel. And when the number of current telecommuters is taken into account, the systemwide reduction is a quite small proportion of total household personal vehicle miles traveled (less than 1%). Consequently, energy and emission effects are of similar magnitude.
- Non-work travel does not appear to increase in the short term.
- Current telecommuters (at least those being studied) have longer-than-average commute distances. Assuming commute lengths for future telecommuters are closer to average, the per-occasion travel reductions of telecommuting will diminish, which may adversely affect both non-work trip generation and residential relocation. These counteracting forces are likely to result in future aggregate travel impacts remaining quite flat, even while the number of telecommuters could increase substantially.

Regarding tele-applications other than telecommuting:

- Other trip purposes can be affected by tele-applications in three ways: substitution, generation and modification. The net impacts for any given application may vary, but historically transportation and telecommunications have had a complementary relationship and there is plenty of reason to expect that pattern to continue.

Regarding other forms of remote work:

- The numbers of home-based businesses, part-time and contingent workers are growing rapidly. These categories of workers have very different travel patterns than conventional workers and our current models are not well-equipped to handle those patterns. Similarly, the growth in the numbers of mobile workers (e.g. using cell phone while traveling) may affect travel patterns in the aggregate.

What can be disseminated to MPOs and state DOTs?

- Synthetic model of transportation impacts presented by Mokhtarian offers useful tool for practitioners, both in terms of "typical" numbers until better (or more region-specific) ones become available, and in terms of a structure which combines key relevant factors to estimate telecommuting adoption and transportation impacts.

What do we need to know?

- Great need for accurate data, both cross-sectional and longitudinal, on:
  - the extent of telecommuting

  - the extent to which people are able to and want to telecommute
  - temporal patterns of telecommuting (frequency and duration)
  - magnitude of telecommuting effects (travel modifications, emissions, productivity increases etc.)
  - the extent of involuntary telecommuting (hoteling and other non-territorial office arrangements)

- From accurate data we need to further refine models predicting various key factors, including the extent to which people are able to, want to and choose to telecommute, and the frequency and duration of their telecommuting.
- Need to be better able to quantify the trip stimulation effects of telecommuting and telecommunications: increased non-work travel of telecommuters, and the realization of latent and induced demand.
- Better understanding of the impact of telecommuting on residential relocation: aggregate net impact, who is most likely to move and to what type of location (suburb, exurb, leapfrog to next town over, out of the region altogether). Survey movers to understand motivations for relocating, particularly the extent to which the move is influenced by telecommuting and telecommunications.
- Data on home-based businesses and their travel patterns: how many, to what extent are they replacing (rather than supplementing) conventional employment, how do their travel patterns vary from the norm.
- Data on mobile workers and their travel patterns
- Little known on travel impacts of telecommunications for *other* trip purposes: shopping, personal business, work-related, and so on. Substitution, stimulation and modification effects are possible.
- Need better information on the cost-effectiveness of telecommuting relative to other transportation policy measures. Requires an improved ability to predict the demand for tele-commuting.
- Need to refine the synthetic model presented by Mokhtarian to make it disaggregate, probabilistic, simulation-based, dynamic.
- Need funding to do research, demonstrations.

Impacts of Telecommunications on Urban Form

What do we think we know?

- Technology is inherently neutral; it can be used to support concentration as well as decentralization. It facilitates location decisions – in either direction – that are motivated or driven by other reasons. At least in the short term, supply does not dictate demand. In the medium term, supply may educate and influence demand.

- Historically, advancements in transportation technology (streetcar, automobile) that increased travel speeds have been followed by increasingly decentralized development. However, these changes have been exacerbated by public policies making fringe locations more attractive.
- Jean Gottman: "It all depends on what people decide to do." Thus, theoretically policy-makers can help shape the impacts of technology rather than passively let them happen, but the "political will" to do so is often absent.
- All else equal, reducing the friction of distance is going to increase the distances people are willing to travel.
- Different types of changes take place at different scales: we see concentration of financial and other specialized activities across different metropolitan areas, together with decentralization within metropolitan areas.
- The announcement of the 'death of distance' has been premature. Distance and location still matter, although telecommunication has somewhat reduced their importance.
- The flexibility offered by telecommunications networks is likely to have a modest effect on urban form as location decisions are dominated by the least flexible networks (e.g., airports) rather than by the most flexible elements.
- Not everyone has equal access to technology. Market forces will at least initially determine who gets what levels of service – e.g. Wall Street will get it first. Need policy intervention to narrow the gap between information haves and have nots.
- Capacity doesn't equal access (you may have the bandwidth or the channel, but not the service). Even among those with access, utilization can vary.
- The accessibility of the technology used in a given context depends on the opportunity cost of the user's time. People with a high opportunity cost (e.g. physicians) will have readily accessible technology; others may have to travel in varying degrees to access technology. For the same person, opportunity costs may vary from one context to the next, resulting in different technology choices.
- We are moving toward an era in which residential location precedes work location choice. This contrasts with historical patterns and is due, in part, to the growth in two-worker households and the low costs of travel. One likely implication is an increase in travel.

What can be disseminated to MPOs and state DOTs?

- Information on what experiments are being tried, what results are being obtained. Even anecdotal information on what works and what doesn't is useful. Need information clearing-house; make it easy to figure out where to go for information. Need to make relevant information generated by those outside of transportation circles (e.g., state depts. of energy) readily available.
- Telecommuting manuals and other how-to-do-it guidance.

Advice to MPOs and state DOTs:

- Use caution. Planners (and policy makers exposed to popular media expectations) may be jumping to conclusions too fast, buying overoptimistic forecasts of the impacts of technology. This can lead to bad planning decisions.
- Read. Become acquainted with literature *on both sides* of an issue so that you can formulate your own informed judgement about likely impacts, and update that judgement as new information becomes available. Some suggested readings include the Office of Technology Assessment (OTA) report on *Technological Reshaping of Metropolitan America* and the book titled *Telecommunication and the City* by Marvin and Graham. The latter work in particular offers an excellent review of the literature as well as a useful conceptual framework.
- Far from reducing travel, we have seen historically that every transportation and telecommunications improvement has resulted in a net complementary effect on travel (even though substitution also occurs). Hence, MPOs should be worried about how to deal with travel demand that is larger than expected rather than smaller, and spread over a region that continues to decentralize.
- Acquire some telecommunications expertise, to foster creativity in generating and evaluating new ideas.
- Foster the use of technology in public forums (televillage, library) so as to narrow the gap between the haves and have-nots.

What do we need to know?

- General question: How will "changes in the structure of economic activity" (Giuliano) – such as the rise in small businesses, distributed work teams, flexibility in who-what-when-where-how work gets done—affect land use patterns?
- Specifically, what impacts will strategies such as hoteling and other non-territorial office arrangements have on real estate?
- How effective are telecommuting centers (in terms of institutional viability and travel impacts)? What mixtures of uses make sense under what circumstances?
- How will the increase in the number of self-employed individuals affect residential location decisions?
- We need to think in terms of there being a basket of transportation policies from which we can pick for a region—one size or bundle doesn't fit all. The relative cost-effectiveness of the measures considered must be better understood.
- Need more user-friendly transportation/emissions/land use models for real-time sketch planning, decision support, cost-benefit analysis. Need some prototype simulations to be conducted and made available to planners.
- What are the impacts of telecommuting and telecommunications in rural areas?
- Academics should join forces with practitioners to perform experiments and learn from them. We should also learn from what we do know already.